

cementing value, their stability, and their higher resistance to disintegration by moisture. Another advantage is that by reason of their containing but a small percentage of volatile constituents, they set up quickly and do not bleed during the hot days of the summer. Coat tars and paraffine base petroleumums have been used but they are deficient in cohesive quality. No binder containing paraffine should be used, as it tends to make a mushy, disagreeable mud in wet weather, and does not bond well with the stone. To provide against the use of inferior materials, the road officials should buy a binder of known quality and furnish it to the contractor. In case this is not done, the road may be paid for at so much per gallon of bitumen used instead of by the square yard, and thus leave the contractor no incentive to economize on the amount of binder used.

The prices of bituminous macadam varies within rather wide limits in different localities, owing to variations in the cost of labor and materials, amount of work to be done, and the distance the materials have to be hauled. The addition of the bitumen by the penetration method will usually add from 25 to 35 cents per square yard to the cost of the water-bound macadam. Where the whole road is built new, with a four inch base, two inch wearing surface, and using lake asphalt as the binder, the cost is from \$1.00 to \$1.20 per square yard. With other binders the cost is less in proportion to the cost of the binder, but since the binder composes about 10% of the road, and is such a vital part of it, no economy should be practiced here. For the same character of work, using the same materials and labor, the mixing method costs from \$1.60 to \$2.00 per square yard, besides requiring a much larger outlay for plant equipment and machinery. By the penetration method the bitumen may be shipped in tank cars to the nearest railway siding, there pumped directly into the pressure distributors by the same engine used to supply the air-pressure, and thence hauled to the point of application at a minimum expense. The pressure distributor is about the only expensive piece of machinery to be bought. Where the amount of work to be done will not justify the purchase of a machine, it may be rented from the asphalt companies at a reasonable rate.